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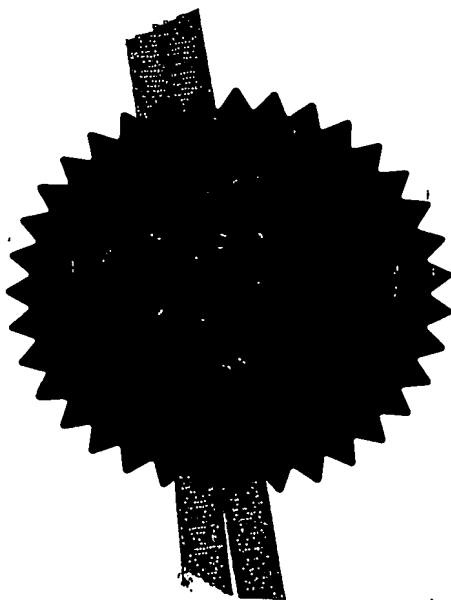
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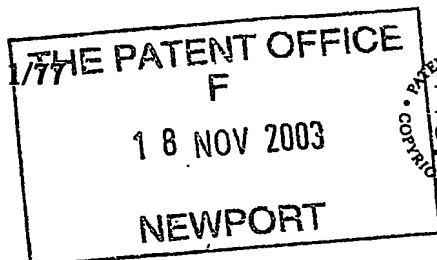
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Dated 12 November 2004





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P01/7700 0.00-0326790.3

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# Request for grant of a patent

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1. Your reference

IAM/EMW/P/25347.GB

2. Patent application number

(The Patent Office will fill in this part)

18 NOV 2003

0326790.3

3. Full name, address and postcode of the or of each applicant (underline all surnames)

MADISON FILTER 981 LIMITED  
Knowsley Road Industrial Estate  
Haslingden  
Lancashire BB4 4EJ UNITED KINGDOM

08043218001

Patents ADP number (If you know it)

If the applicant is a corporate body, give the country/state of its incorporation

UNITED KINGDOM

4. Title of the invention

FILTER CLOTH RETENTION APPARATUS

5. Name of your agent (If you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (Including the postcode)

WILSON GUNN M'CAW  
41-51 ROYAL EXCHANGE  
CROSS STREET  
MANCHESTER  
M2 7BD

Patents ADP number (If you know it)

7153927001 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (If you know it) the or each application number

Country

Priority application number  
(If you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

YES

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

**Patents Form 1/77**

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description

6

Claim(s)

-

Abstract

-

Drawing(s)

1

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

Request for substantive examination (*Patents Form 10/77*)

Any other documents  
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

*Ian A. Middlemist*

Date

17/11/2003

12. Name and daytime telephone number of person to contact in the United Kingdom

Ian A. Middlemist

0161 827 9400

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### FILTER ELEMENT MOUNTING APPARATUS

This invention relates to an improved filter element mounting apparatus which may of particular application to pleated filter elements.

Pleated filter elements typically comprise a pair of self-supporting filter cloths each folded into a zig-zag configuration and mounted in a frame adjacent each other, usually with the inward and outward folds of the two cloths aligned so that a top view shows a series of diamond or fusil shaped chambers defined between the filter cloths. EP-A-0,351,850 (RAPP) shows a filter assembly featuring pleated filter cloths, the upper and lower edges of which are mounted in plastics and bodies, and the inward folds of which are overlapped to provide overlap zones for securing the filter cloths together using adhesive. In WO 03/015893 (MADISON) we disclose a pleated filter element wherein the edges of the filter cloths are sealed by a sealant and held in channel sectioned strips.

In so far as these are secured primarily by the use of adhesive, a number of problems arise as the adhesive can fail during continuous use at temperatures above for example 90°C, fabrication can be time consuming and awkward as the ends have to be held together precisely in accurate alignment and without any displacement, while the adhesive is applied and cured or dried. If the ends are not lined up correctly, or allowed to slip during curing, then the seam will leak. The use of partially overlapping pleats secured by adhesive also reduces the filter surface available to pass filter liquor due to the overlap and also due to the closure of pores in the filter medium in the adhesive coated area. This reduction in surface area materially affects the flow rate of the filter as a whole.

In order to overcome some of the problems arising in pleated filters, including the exposure of fold lines to abrasion from particle streams, and the fragility of the filter medium, attempts at reinforcement and protection have been made, including use in the said WO 03/015893 of a mesh or perforated sheet support for a nonwoven fibrous batt filter material to which the batt is attached by hydroentanglement causing fibres of the batt to penetrate the mesh and thus anchor the batt to the mesh. Other expedients include the use of angle-sectioned strips covering outward pleat folds, or within inward pleat folds, or circular or U-shaped members, and the provision of channel section cover strips to protect and clamp the adhered edges of the filter elements. The mesh or perforated sheet support for the filter medium, and the other protective strips and top and bottom supports can in some cases be of rigid plastics, but are usually of metal such as steel. On scrapping of used filter elements however, incineration leaves a substantial amount of scrap metal for disposal. The use of metal components also increases the weight of each filter element making filters with large surface areas heavy and difficult to handle. Some of the reinforcing elements such as pleat fold covering strips, result in a loss of effective filtration area, as they cover substantial areas of the filter medium surface.

Metal reinforcements are also used in many current compact filter elements which cover the ends of the pleated filter medium, which comprise profiled strips with a channel shaped part which receives the ends of the filter elements and grips them in a compression spring grip, with extended side wings which extend out to each side to cover the full width of the last pleat of the filter and thereby protect the end of the filter element from abrasion from air or other fluid medium entrained particles.

In many filter elements these metal reinforcements are not however sufficient to give the filter rigidity and can be easily deformed prior to or during installation, or during use. Any deformation of the metal sides means that the filter elements become misshapen and makes them difficult to install or remove from the slot in the filter housing through which the element is inserted.

It is an object of the present invention to improve on existing compact filter elements by avoiding the use of metal components or adhesive, to avoid the failure incidence of adhesive, and the presence of scrap metal after incineration of life expired filter elements.

In accordance with the present invention, a filter construction comprises a filter element comprising two pleated filter cloths mounted so that their folds are oppositely directed to form a series of lozenge-sectioned filtration chambers, wherein the edges of the filter cloths, parallel to the pleats or folds, are encapsulated in an edge moulding.

The pleated filter cloths are preferably also secured at top and bottom to plastics top and bottom elements, or encapsulated within moulded members.

The edge mouldings may form rigid side elements which may be reinforced by placing rods or profiles, which may be made from glass, carbon or synthetic fibre reinforced plastics; or by placing fibres or braid or other textiles also made from glass, carbon or synthetic material into a mould before, during, or after the resin is poured into the mould.

The edge mouldings are preferably of polyurethane resin, which may advantageously be a two part thermo-setting preparation which sets within 20 minutes after mixing, and may have a Shore A hardness of for example 90.

The side elements at opposite sides of the filter element may be made complementary, so that a plurality of elements can be connected together side to side. A possible form of interconnection may comprise forming the edge moulding on one side with two ribs leaving a channel therebetween, and the edge moulding on the other side with a single rib which is dimensioned and shaped so as to fit in the channel.

Similar interconnectable parts may be provided on the top and bottom elements, so that a filter panel both higher and wider than the individual filter elements can be built up.

An embodiment of filter element in accordance with the invention will now be described by way of example, with reference to the accompanying drawings, wherein:-

Fig. 1 is an elevational view of the filter element;

Fig. 2 is a sectional view of the filter element on line II - II of Fig. 1; and

Fig. 3 is an enlarged sectional view of the sides of two adjacent filter elements showing how the filter cloths are secured at their sides, and interlocking of side retaining members.

As shown in the drawings, a compact filter element embodying the invention consists of two pleated filter cloths 10, 11 extending alongside each other with the pleats arranged so that both inward and outward folds coincide, so that the cloths 10, 11 enclose between them a volume which in cross-section resembles a series of lozenge or diamond shaped cavities 12.

The top and bottom edges of the cloths 10, 11 are received in top and bottom frame members 13, 14, the edges preferably being introduced into the moulds for the frame members before introduction of the resin

from which they are moulded; or whilst the resin is still unset, so that the edges of the cloths are moulded integrally with or "potted" in the resin.

The side ends of the cloths 10, 11 are secured by bringing the edges of the two cloths together, as at 15, in Fig. 2 and moulding the joined edges into a vertical side member 16 or 17, either pinched together as in Fig. 2, or laid flat after the pinch point in the mould, as a partial last pleat in Fig. 3.

Fig. 2 shows partial last pleats 18, 19 bonded by moulding into the surface of the respective side members 16, 17, whilst partial pleats 20, 21 are deeply embodied in the resin in Fig. 3.

The vertical side members 16, 17 are made of complementary cross-section to enable abutting side members to interlock as in Fig. 3. Side members 16 are formed with a single rib 22, whilst side members 17 are formed with spaced ribs 23, 24 with a groove 25 between which is capable of receiving the rib 22 on the side member 16 in a force fit.

The side members 16, 17 contain embedded therein longitudinal reinforcing elements such as rods 26 of suitable plastics material. Suitable materials include high density polyolefines, polyamides or aryl materials. Alternative reinforcements may be in the form of bundles of fibres or yarns, nonwoven fabrics or meshes of any suitable synthetic material. Similar reinforcements may be provided in the top and bottom members 13, 14.

Fig. 3 shows how preferably the ends of the filter cloths 10, 11 are embedded in and anchored in the side members 16, 17, with at least an inward fold of an end pleat of each fabric encapsulated in the moulded resin side members. This provides for firm anchorage and effective sealing of the filter cloths, and the complementary ribs and grooves of the



side members ensure interconnectability of the filter elements to provide larger filter panels. To this end, the top and bottom members 13, 14 may also be made to be interconnectable.

The use of all-combustible material in the cloths, top bottom and side members and the avoidance of metal reinforcements in the top and bottom members and side members, or in association with the filter cloths means that spent filter elements can be disposed of by incineration without leaving metal scrap for disposal otherwise.

The side members 16, 17 also are wide enough to prevent abrasion of the filter elements by particles entrained by air or other fluids incident from the sides.

The construction according to the invention is advantageous as the interconnectability which it affords allows filters of large surface areas to be installed easily from small lightweight units. For example, a typical compact filter element of size 1.5 x 1.5m is too heavy to be installed by a single person and can be very awkward to install and / or remove, especially as the operators have to be careful not to damage the metal sides. With the instructions according to the invention however, smaller lightweight units of say 0.5 x 1.5m can be slotted into place by a single operator and the resin frame sides remove concerns about deformation and make the installation quick and low in risk of damage.

It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiments which are described by way of example only.

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